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June 20, 1975

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DEPARTMENT OF ELECTRICAL ENGINEERING
THE TECHNOLOGICAL INSTITUTE

N. J. A. Sloane
Mathematics Research Center
Bell Telephone Laboratories, Inc.
Murray Hill, New Jersey

Dear Dr. Sloane:

I have read with much interest your book, "A Handbook of Integer Sequences". In response to your call for sequences not listed, I am including the following.

1. Period of patterns of growth.

Width of Strip	Period
1	1
2	2
3	3
4	5
5	5
6	8
7	13
8	13
9	13
10	26
11	13
12	91
13	13
14	106

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R. G. Schrandt and S. M. Ulam, "On Recursively Defined Geometrical Object and Patterns of Growth", in A. W. Burks, "Essays on Cellular Automata", University of Illinois Press, 1970 (p. 238).

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add to list

2. a) Number of k variable cascade realizable functions.

k	$N_{cas}(k)$
2	10
3	114
4	1,842
5	37,226
6	902,570
7	25,530,658
8	825,345,250
9	30,016,622,298
10	1,212,957,186,330

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b) Number of k variable disjunctively realizable functions.

k	$N_{dis}(k)$
2	10
3	114
4	2,154
5	56,946
6	1,935,210
7	80,371,122
8	3,944,568,042
9	223,374,129,138
10	14,335,569,726,570

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c) Number of functions realized by k-input cascades of cells allowing permutation of input labels.

k	$T_{cas}(k)$
2	16
3	152
4	2,368
5	47,688
6	1,156,000
7	32,699,080
8	1,057,082,752
9	38,444,581,640
10	1,553,526,946,144

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d) Number of functions realized by k-input disjunctive networks of cells allowing permutation of input labels.

k	$T_{dis}(k)$
2	16
3	152
4	2,680
5	68,968
6	2,311,640
7	95,193,064
8	2,645,069,336
9	461,938,616,104
10	16,756,882,325,464

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All of these sequences are described by a recursive relation and as far as I know, there exist no closed form solutions. Edward Bender of the University of California has found a closed form expression for a) and b) for the case $k \to \infty$.

J. T. Butler, "On the Number of Functions Realized by Cascades and Disjunctive Networks", to appear in July 1975 IEEE Transactions on Computers.

3. Sequence 300 on the structure of Rayleigh polynomial also describes the "number of distinct disjunctive topologies" in J. T. Butler, "Networks of Two-Input One-Output Flexible Cells - A study of the Logical Properties and Techniques for Synthesizing Realizable Functions", Ph.D. dissertation, Department of Electrical Engineering, Ohio State University, Columbus, Ohio 43210, March 1973.

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I hope these sequences are useful. If you have any supplements to your book, I would appreciate receiving them.

Best regards,

Jon T. Butler

Jon T. Butler
Assistant Professor

JTB/lr